



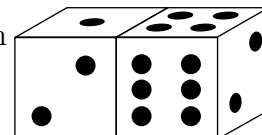
# Problem Set I

## Math Contest Preparation I – Intermediate Math Circles

**Acknowledgement:** These problems are from the 2007 European Pink Kangaroo contest.

1. Andy, Benny and Charlie have thirty balls altogether. If Benny gives five to Charlie, Charlie gives four to Andy and Andy gives two to Benny, then the three boys will each have the same number of balls. How many balls did Andy have to start with?  
 A 8                      B 9                      C 11                      D 13                      E 15

2. The diagram shows two ordinary dice. What is the total number of spots on all the faces that cannot be seen in the diagram?  
 A 27                      B 24                      C 12                      D none of the above



3. An international organisation has 32 members. Every year the number of members increases by 50%. How many members will it have three years from now?  
 A 182                      B 128                      C 108                      D 96                      E 80

4. In a triangle  $JKL$ ,  $M$  is the midpoint of  $JK$ ,  $N$  is the midpoint of  $MK$  and  $P$  is the midpoint of  $KL$ . If the area of triangle  $JKL$  is 96, what is the area of triangle  $JNP$ ?  
 A 16                      B 24                      C 32                      D 36                      E 48

5. Beth has divided her 2007 marbles into three bags A, B, C in such a way that each bag contains exactly the same number of marbles. Beth then moves two-thirds of the marbles in bag A to bag C. What is the new ratio of marbles in bag A to bag C?  
 A 3:2                      B 2:3                      C 1:2                      D 1:3                      E 1:5

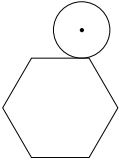
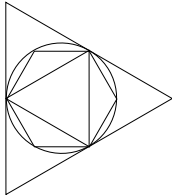
6. To complete the table, each cell must contain either 0 or 1, and the total of each row and column must be 2. What are the values of the entries  $X$  and  $Y$ ?  
 A  $X = 0, Y = 0$       B  $X = 0, Y = 1$       C  $X = 1, Y = 0$   
 D  $X = 1, Y = 1$       E It is impossible to complete

0		0	
		0	
	X		1
	Y		

7. A magical island is inhabited by knights (who always tell the truth) and liars (who always lie). One day twelve islanders (including both knights and liars) gathered together and issued three statements. Two people said, ‘There are exactly two liars among us’. Four other people said, ‘There are exactly four liars among us’. The remaining six people said, ‘There are exactly six liars among us’. How many liars were there?  
 A 2                      B 4                      C 6                      D 8                      E 10
8. To what power should we raise  $4^4$  to get  $8^8$ ?  
 A 2                      B 3                      C 4                      D 8                      E 16





9. A trapezoid is formed by removing one corner of an equilateral triangle. The two copies of this trapezoid are placed side by side to form a parallelogram. The perimeter of the parallelogram is 10cm longer than the perimeter of the original triangle. What was the perimeter of the original triangle?  
A 10cm      B 30cm      C 40cm      D 60cm      E more information needed
10. A sequence of letters KANGAROOKANGAROO...KANGAROO is formed by repeating the word KANGAROO twenty times. A new sequence is formed by erasing alternate letters, starting with the first letter. Then, in this new sequence, alternate letters are again removed, starting with the first letter. This process is repeated until only one letter is left. What letter remains?  
A K                  B A                  C N                  D G                  E O
11. Two schools play against each other in a table tennis tournament. Each school is represented by five students. Every game is a doubles game, and every possible pair from the first school must play one game against every possible pair from the second school. How many games will each student play?  
A 10                  B 20                  C 30                  D 40                  E 50
12. A coin with diameter 1 cm rolls around the outside of a regular hexagon with edges of length 1 cm until it returns to its original position. In centimeters, what is the length of the path traced out by the centre of the coin?  
A  $6 + \pi/2$       B  $12 + \pi$       C  $6 + \pi$       D  $12 + 2\pi$       E  $6 + 2\pi$
- 
13. In a box there are three red cards, three green cards, three yellow cards and three blue cards. For each colour, the three cards are numbered 1, 2 and 3. If you select three cards from the box at random, which of the following is most likely?  
A The three cards are the same colour.  
B The three cards are numbered 1, 2, 3 irrespective of colour.  
C The three cards are different colours.  
D The three cards have the same number  
E None, the events A - D are equally likely.
14. An equilateral triangle and a regular hexagon are inscribed in a circle which is itself inscribed in an equilateral triangle.  $L$  is the area of the large triangle,  $S$  is the area of the smaller triangle and  $H$  is the area of the hexagon. Which of these statements is true?  
A  $L = H + 3S$       B  $H = LS$       C  $H = \frac{1}{2}(L + S)$   
D  $H = L - S$       E  $H = \sqrt{LS}$
- 
15. Let  $N$  be the smallest integer such that  $10 \times N$  is a perfect square and  $6 \times N$  is a perfect cube. How many positive factors does  $N$  have?  
A 30                  B 40                  C 54                  D 72                  E 96

